

WHAT IS CLAIMED IS:

1 1. An integrated circuit fabrication process, the process comprising:
2 exposing a photoresist material provided including arylalkoxysilane
3 over a substrate to a first radiation at a first lithographic wavelength;
4 selectively transforming a top portion of the material in accordance
5 with a pattern provided on a mask or reticle; and
6 exposing the photoresist material to a second radiation at a second
7 lithographic wavelength,
8 wherein the first lithographic wavelength is shorter than the second
9 lithographic wavelength and the transformed top portion of the photoresist material
10 being non-transparent to the second radiation.

1 2. The process of claim 1, wherein the first lithographic wavelength is
2 selected from a wavelength including 157 nm, 126 nm, and 13.4 nm.

1 3. The process of claim 1, wherein the second lithographic wavelength
2 is selected from a wavelength including 365 nm, 248 nm, and 193 nm.

1 4. The process of claim 1, wherein the exposing step with the first
2 radiation is performed before the exposing step with the second radiation.

1 5. The process of claim 1, further comprising providing the transformed
2 top portion of the photoresist material as a self-aligned mask for the exposing step
3 with the second radiation.

1 6. The process of claim 1, wherein the photoresist material is a positive
2 photoresist material.

1 7. The process of claim 1, wherein the transformed top portion of the
2 photoresist material comprises polymerized organoarylalkoxysilane material.

1 8. The process of claim 7, wherein the thickness of the transformed top
2 portion is at least 10 nm.

1 9. The process of claim 1, further comprising transferring the pattern of
2 the mask or reticle onto the photoresist material, wherein a resolution of the
3 transferred pattern is determined by the first lithographic wavelength.

1 10. An integrated circuit fabrication system, comprising:
2 a first light source providing a first radiation at a first lithographic
3 wavelength;
4 a second light source providing a second radiation at a second
5 lithographic wavelength; and
6 a self-aligned mask included in a photoresist layer, the self-aligned
7 mask formed by exposure to the first radiation at the first lithographic wavelength in
8 accordance with a patterned mask or reticle.

1 11. The system of claim 10, wherein the first lithographic wavelength is
2 smaller than the second lithographic wavelength.

1 12. The system of claim 11, wherein the first lithographic wavelength is
2 selected from a wavelength including 157 nm, 126 nm, and 13.4 nm.

1 13. The system of claim 11, wherein the second lithographic wavelength
2 is selected from a wavelength including 365 nm, 248 nm, and 193 nm.

1 14. The system of claim 10, wherein the photoresist layer is comprised of
2 positive photoresist material.

1 15. The system of claim 10, wherein the self-aligned mask comprises at
2 least one cross-linked and or polymerized area of a top arylalkoxysilane layer.

1 16. The system of claim 15, wherein the self-aligned mask is located at
2 the top portion of the photoresist layer and has a thickness between 10 nm and
3 10000 nm.

1 17. The system of claim 16, wherein each of the polymerized area
2 prevents the second radiation from transforming the portion of the photoresist layer
3 correspondingly underneath.

1 18. A method of extending the use of 248 nm and 193 nm photoresists to
2 lithographic regimes less than approximately 157 nm in an integrated circuit, the
3 method comprising:

4 providing a first radiation at a short lithographic wavelength; and
5 transforming a top portion of a photoresist layer provided over a
6 substrate in accordance with a pattern on a mask or reticle, wherein the transformed
7 top portion on top of the photoresist layer includes at least one polymerized area
8 where the first radiation is incident thereon and comprises the pattern from the mask
9 or reticle.

1 19. The method of claim 18, further comprising providing a second
2 radiation at a long lithographic wavelength after providing a first radiation, wherein
3 the short lithographic wavelength is smaller than the long lithographic wavelength.

1 20. The method of claim 19, wherein the mask or reticle is omitted at a
2 second radiation step.

1 21. The method of claim 19, wherein the second radiation is not
2 transmitted through the polymerized area.

1 22. The method of claim 21, further comprising patterning the photoresist
2 layer in accordance with each of a plurality of polymerized areas on top of the
3 photoresist layer and the second radiation, wherein the resolution of the patterned

- 4 photoresist layer is determined by the short lithographic wavelength of the first
- 5 radiation.

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